REMARKS

Reconsideration of this application, based on the following remarks, is respectfully requested.

Claims 1 through 25 and 27 through 31 remain in this case. No claim is amended. Claim 26 was previously canceled.

Claims 1 through 4, 6, 7, 10 through 15, 17, 18, 21 through 25, 27, 28, and 31 were provisionally rejected under the judicially-created doctrine of double patenting of the obviousness type, on the grounds that these claims were not patentably distinct over claims 21 through 27 and 36 through 46 of copending application S.N. 10/678,893.

Applicants first respectfully traverse the double patenting rejection, on the grounds that the rejection as stated is inadequate to support an obviousness-type double patenting rejection. The rejection as stated merely tabulates the claims in the two patent applications, and asserts merely that the claims are "extremely similar and are not patentably distinct from each other".[1] However, there is no rationale stated by the Examiner on what the differences are between the claims, much less on how those differences are obvious differences. Applicants therefore respectfully traverse the rejection on the grounds that the Examiner has not presented a *prima facie* obviousness determination between the alleged conflicting claims.

Applicants further respectfully submit that the provisional double patenting rejection is moot, considering that the alleged conflicting claims in copending application S.N. 10/678,893 have been amended since the rejection was made.

For these reasons, reconsideration of the provisional double patenting rejection is respectfully requested.

[1] Office Action of July 7, 2006, page 3 *et seq.*

Claims 1 through 3, 6 through 9, 11 through 14, 17 through 20, 22 through 25, and 27 through 30 were finally rejected under §102(e) as anticipated by the Smith reference[2]. Claims 4, 5, 15, 16, and 26 were rejected under §103 as unpatentable over the Smith reference in view of the Zhang et al. reference[3]. Claims 10, 21, and 31 were rejected under §103 as unpatentable over the Smith reference in view of the Kramer reference[4].

As previously argued,[5] claim 1 is directed to a method for encoding data associated with a page within a non-volatile memory. The method of claim 1 requires that the error correction code (ECC) calculations on the first segment of the page are performed according to a first ECC algorithm to encode the first segment, and that the ECC calculations on the second segment of the page are performed according to a second ECC algorithm. The method of claim 1 provides important benefits in the encoding of data as it is stored in a flash memory. Specifically, the ability to use different ECC codes provides great flexibility in the optimizing of error correction performance, for example in the storage of information of differing sensitivity to error, and improved efficiency in using more complex ECC operations only to the extent necessary for the desired error correction capability.

Applicants traverse the final rejection of claim 1 and its dependent claims, on the grounds that the Smith reference falls far short of the requirements of claim 1. Specifically, Applicants submit that the Smith reference fails to disclose the dividing of a page of non-volatile memory into two segments, in combination with performing ECC calculations on one segment according to one ECC algorithm and performing ECC calculations on the other segment according to a different ECC algorithm.

The Smith reference is directed to the selection of an error correcting code based on a "fundamental error rate" for a given memory device, considered as a whole. The reference expressly teaches that the data structure of its memory may be associated with one or more integrated circuits "within which it is reasonable to assume that the fundamental error rate will

[2] U.S. Patent No. 6,961,890 B2, issued November 1, 2005 to Smith, from an application filed August 16, 2001.
[3] U.S. Patent No. 6,662,333, issued December 9, 2003 to Zhang et al., on an application filed February 4, 2000.
[4] U.S. Patent No. 6,182,239, issued January 30, 2001 to Kramer.

be generally homogeneous".[6] As such, the Smith reference applies a single error correcting code over an entire memory array; while the reference discloses multiple "dividers" representing the error correcting codes of different weight, these alternative dividers "are alternatives to the first divider 206, and [ ] only one divider may be used at a given time".[7] The application of one error correcting code over the memory array as a whole, according to the Smith reference, is also apparent considering that the selection of the error correcting code is based on the parameters of technology type and use application,[8] both of which apply to the memory array as a whole and not to individual segments within a page that itself is within the array.

The Examiner points to portions of the Smith reference that he alleges as teaching the dividing of a page of the memory into two segments, namely payload and redundancy portions.[9] Applicants submit that this portion of the reference cannot correspond to the two segments of claim 1, because these "payload" and "redundancy" portions are the *result* of the error correction coding of the Smith reference,[10] and therefore are not *themselves* encoded as recited in claim 1.

Nor does the Smith reference elsewhere disclose the dividing of a page of a non-volatile memory into segments, and performing ECC calculations to encode the segments within a page according to different ECC algorithms, as required by claim 1. Rather, as discussed above, the Smith reference selects among available error correcting codes and then uses that selected error correcting code over the entire memory array as a whole.

Applicants therefore respectfully submit that claim 1 and its dependent claims are novel over the Smith reference, because the reference fails to disclose the steps recited in claim 1. Applicants therefore respectfully traverse the final rejection of claim 1 and its dependent claims, on the grounds that the rejection is in error as based on a misinterpretation of the teachings of the reference.

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[5] *See* Amendment of June 8, 2006.
[6] Smith, *supra,* column 4, lines 18 through 22.
[7] *Id.,* at column 4, lines 29 through 31.
[8] *Id.,* at column 6, line 39 through column 7, line 2; column 7, line 57 through 64; column 8, lines 32 through 46.
[9] Office Action, *supra,* citing Smith, *supra,* column 4, lines 10 through 31.
[10] Smith, *supra,* column 4, lines 38 through 44 ("Each ECC word is associated with, and provides redundancy for, a corresponding data word.")

Applicants also submit that claim 1 and its dependent claims are patentably distinct over the applied references, on the grounds that the combined teachings of the references fall short of the requirements of claim 1, and that there is no suggestion from the prior art to modify those teachings in such a manner as to reach the claims.

As argued above, Applicants submit that the Smith reference nowhere discloses the use of different ECC algorithms in the encoding of its data blocks within a page. Nor do the other references, specifically the Zhang et al. and Kramer references, provide any teachings in this regard. Applicants therefore respectfully submit that the combined teachings of the references fall short of the requirements of claim 1, because none of the references disclose the performing of error correction code calculations on first and second segments of a given page according to first and second ECC algorithms, respectively, as required by claim 1.

Nor is there any suggestion from the prior art to perform ECC calculations on first and second segments of data in a page according to different ECC calculations. None of the references provide any hint that different ECC algorithms may be used over different portions of data within the same page.

Accordingly, Applicants submit that claim 1 and its dependent claims are patentably distinct over the prior art of record in this case, and traverse the §103 rejection accordingly.

Applicants also traverse the final rejection of claim 11 and its dependent claims, and submit that these claims are also novel and patentably distinct over the applied references.

Claim 11 is directed to a memory system including a non-volatile memory that includes a page with a data area and an overhead area. As previously argued,[11] the system of claim 11 includes code devices for performing ECC calculations according to a first ECC algorithm on a first segment of the page, and for performing ECC calculations according to a second ECC algorithm on a second segment of the page. The system of claim 11 now provides additional advantages over conventional non-volatile memory systems, especially in the optimization of the

[11] Amendment, *supra*.

error correction coding for different portions of data, perhaps having different sensitivity to error, within a single page.

Similarly as discussed above relative to claim 1, Applicants traverse the final rejection of claim 11 and its dependent claims under §102(e), on the grounds that the Smith reference falls far short of the requirements of claim 11. Specifically, Applicants submit that the Smith reference fails to disclose any circuitry for dividing of a page of non-volatile memory into two segments, in combination with circuitry that performs ECC calculations on one segment according to one ECC algorithm and performing ECC calculations on the other segment according to a different ECC algorithm, as required by claim 11.

As discussed above, Applicant submit that the Smith reference teaches only the applying of a single error correcting code over an entire memory array, considering its express teachings that this single error correcting code is selected code based on a "fundamental error rate" for a given memory device, "within which it is reasonable to assume that the fundamental error rate will be generally homogeneous".[12] This assumption of a homogenous fundamental error rate is discloses as based on the parameters of technology type and use application,[13] both of which apply to the memory array as a whole and not to individual segments within a page that itself is within the array. While the reference discloses multiple "dividers" representing the different available error correcting codes from which this selection is made, the reference teaches that these alternative dividers "are alternatives to the first divider 206, and [ ] only one divider may be used at a given time".[14] The Examiner cites specific portions of the Smith reference as teaching the dividing a page of the memory into two segments, namely payload and redundancy portions.[15] But these "payload" and "redundancy" portions cannot correspond to the segments defined by the code devices for dividing of claim 11, because they are the *result* of its error

[12] Smith, *supra,* column 4, lines 18 through 22.
[13] *Id.,* at column 6, line 39 through column 7, line 2; column 7, line 57 through 64; column 8, lines 32 through 46.
[14] *Id.,* at column 4, lines 29 through 31.
[15] Office Action, *supra,* citing Smith, *supra,* column 4, lines 10 through 31.

correction coding,[16] and therefore are not *themselves* encoded, as are the segments recited in claim 11.

In fact, the Smith reference nowhere discloses any function that divides a page of a non-volatile memory into segments, nor any function that performs ECC calculations to encode the segments within a page according to different ECC algorithms, as required of the code devices recited in claim 11. Rather, as discussed above, the Smith reference selects among available error correcting codes and then uses that selected error correcting code over the entire memory array as a whole.

Applicants therefore respectfully traverse the §102 rejection of claim 11 and its dependent claims, on the grounds that the rejection is in error as based on a misinterpretation of the teachings of the reference. Furthermore, Applicants respectfully submit that claim 11 and its dependent claims are novel over the Smith reference, because the reference fails to disclose the code devices required by the system of claim 11.

Applicants also submit that claim 11 and its dependent claims are patentably distinct over the applied references, on the grounds that the combined teachings of the references fall short of the requirements of claim 11, and that there is no suggestion from the prior art to modify those teachings in such a manner as to reach the claims.

As argued above, Applicants submit that the Smith reference nowhere discloses the use of different ECC algorithms in the encoding of its data blocks within a page. Nor do the other references, specifically the Zhang et al. and Kramer references, provide any teachings in this regard. Applicants therefore respectfully submit that the combined teachings of the references necessarily fall short of claim 11, which requires code devices for dividing a page into first and second segments and for performing ECC calculations to encode those segments using first and second ECC algorithms, respectively. Nor is there any suggestion from the prior art to perform ECC calculations on first and second segments of data in a page according to different ECC

[16] Smith, *supra,* column 4, lines 38 through 44 ("Each ECC word is associated with, and provides redundancy for, a corresponding data word.")

calculations, because none of the references provides any suggestion or motivation to use different ECC algorithms may be used over different portions of data within the same page.

Accordingly, Applicants submit that claim 11 and its dependent claims are patentably distinct over the prior art of record in this case.

On similar grounds, Applicants also traverse the final rejection of claim 23 and its dependent claims.

As previously argued,[17] claim 23 is directed to a memory system including a non-volatile memory that includes a page having a data area and an overhead area. The claimed system requires means that divide the page into two or more segments, and means that perform error correction code (ECC) calculations according to a first ECC algorithm on a first segment of the page, and that perform ECC calculations according to a second ECC algorithm on a second segment of the page. The system of claim 23 provides similar advantages in the optimization of the error correction coding for different portions of data, perhaps having different sensitivity to error, within a single page, as discussed above.

For the same reasons as presented above relative to claims 1 and 11 and their respective dependent claims, Applicants submit that claim 23 and its dependent claims are patentably distinct over the applied references. Not only does the Smith reference fail to disclose the system of claim 23, but the combined teachings of all of the applied references fall short of the requirements of the claim and fail to suggest modification of their teachings so as to reach the claims.

As argued above relative to claims 1 and 11, Applicants submit that the Smith reference fails to disclose any circuitry or other means for dividing of a page of non-volatile memory into two segments, in combination with any circuitry or other means that performs ECC calculations on one segment according to one ECC algorithm and performing ECC calculations on the other segment according to a different ECC algorithm. Instead, the Smith reference teaches only the

[17] Amendment, *supra*.

applying of a single error correcting code over an entire memory array, based on its assumption that a memory device has a "fundamental error rate" that is reasonably assumed to be "generally homogeneous",[18] and is based on the parameters of technology type and use application.[19] To the extent that the Smith reference teaches multiple "dividers", these dividers merely correspond to the different available error correcting codes, but "only one divider may be used at a given time".[20] The Examiner relied on the disclosed payload and redundancy portions of a page as taught by the Smith reference;[21] however, these "payload" and "redundancy" portions are the *result* of error correction coding,[22] and therefore are not *themselves* encoded by any means, much less those means that perform ECC calculations as recited in claim 23. Nor does any other passage of the Smith reference provide such teachings.

For this reason, Applicants respectfully traverse the §102 rejection of claim 23 and its dependent claims. Not only is the final rejection in error as based on a misinterpretation of the teachings of the reference, but claim 23 and its dependent claims are in fact novel over the Smith reference, for this reason.

Furthermore, Applicants submit that claim 23 and its dependent claims are not only novel but are patentably distinct over the applied references.

The Smith reference, as discussed above, lacks any teachings of the use of different ECC algorithms in the encoding of its data blocks within a page, and therefore lacks teachings regarding any means for doing so. The Zhang et al. and Kramer references fail to provide any teachings in this regard. Applicants therefore respectfully submit that the combined teachings of the references necessarily fall short of claim 23, and the prior art completely lacks any suggestion or motivation to modify these teachings to provide means that perform ECC calculations on first and second segments of data in a page according to different ECC calculations.

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[18] Smith, *supra,* column 4, lines 18 through 22.
[19] *Id.,* at column 6, line 39 through column 7, line 2; column 7, line 57 through 64; column 8, lines 32 through 46.
[20] *Id.,* at column 4, lines 29 through 31.
[21] Office Action, *supra,* citing Smith, *supra,* column 4, lines 10 through 31.

Accordingly, Applicants submit that claim 23 and its dependent claims are patentably distinct over the prior art of record in this case.

For these reasons, Applicants submit that all of the claims now in this case are patentable over the prior art of record.

And for these reasons, Applicant respectfully submits that all claims now in this case are in condition for allowance. Reconsideration of this application is therefore respectfully requested.

Respectfully submitted,

/Rodney M. Anderson/

Rodney M. Anderson
Registry No. 31,939
Attorney for Applicants

Anderson, Levine & Lintel, L.L.P.
14785 Preston Road, Suite 650
Dallas, Texas 75254
(972) 664-9554

[22] Smith, *supra,* column 4, lines 38 through 44 ("Each ECC word is associated with, and provides redundancy for, a corresponding data word.")